

S M T

Precision Lead-free Reflow Oven

Model : AT-R3028

User manual



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## Introduction

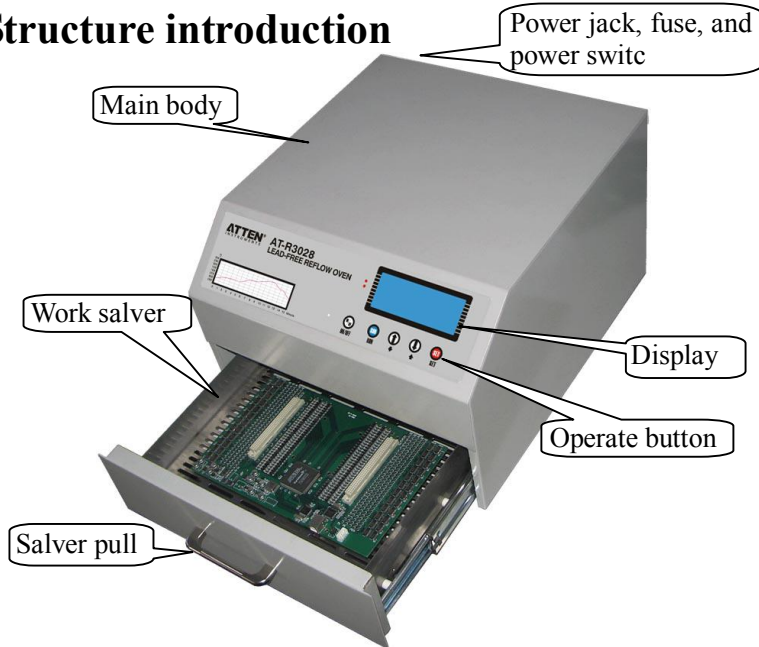
The **“MINI IR REFLOW OVEN”** is equipment that used for electron production and maintain of SMT technique. The product adopts the far-infrared heating components and excellent sense temperature materials. Through the precise control of the microcomputer, make the temperature control curve match to the request of the SMT production technique completely. The “temperature control curve” of the equipment can be adjusted accurately, so it can satisfy the request of many kinds of soldering paste which are different material parameters. It can shut down and alarm the faults automatically. Also it has many functions, such as soldering, maintenance and drying.

The structural performance and operation has been upgraded and improved. Using Chinese-English bilingual operating system and efficient and convenient power switch.

## Main technique parameter

- \* Working voltage: AC220V(AC110V order)
- \* Working frequency:50-60Hz
- \* Maximum output power: 1650W
- \* Heating methods: infrared radiation and hot air mix heating
- \* Operating system: Chinese-English operating system
- \* Working mode: automatic soldering mode, maintenance mode adjustable
- \* Temperature curve paragraph: warm-up, heating, soldering, heat preservation and cooling segment.
- \* Range of temperature and time on warm-up: 70~150℃, 0~5Min
- \* Range of temperature and time on heating: warm-up temperature to 250℃, 0~5Min
- \* Range of temperature and time on soldering: heating temperature to 300℃, 0~30s
- \* Range of temperature and time on heating preservation: soldering temperature —(0~50℃)
- \* Tray specifications: 305×320mm
- \* Size: 460×372×275mm

## Structure introduction



**Fig1 Mechanical structure**

Work salver: placed PCB board and other drying goods

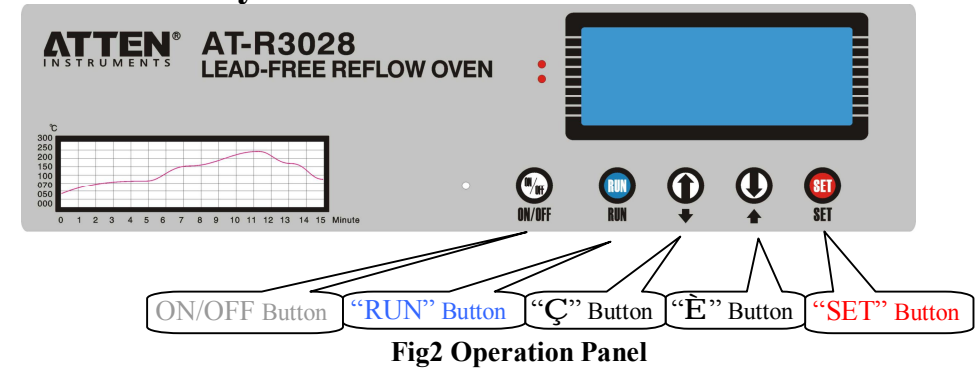
Salver pull: pull the salver to placed things

Power jack, fuse and power switch: supply power for main body and suddenness protect

Display: display the setting parameter and working state

Operate button: operate the machine and setting parameter

## Function key introduction



**Fig2 Operation Panel**

**ON/OFF:** press the key to turn on or turn off the machine. If the working state hasn't quit or the temperature hasn't declined to safety the system can't force quit.

**"Ç" "È":** using to change the setting parameter.

**SET:** running setting parameter and save the setting.

**RUN:** running the machine, exit running state or exit setting state.

## The function of temperature curve

In the SMT production process, adjust the temperature curve according to different alloy formula or tin solder paste, which make the better quality of product. Usually the reflow soldering has five temperature segments. The temperature and the time can be set to satisfy the request of different PCB board. In order to better explain the requirements of the various temperatures and the role we will describe every temperature segment in the follow.

### 1. The purpose and role of the warm-up

Heating the PCB board from room temperature to 120~150°C which make the moisture fully volatile and eliminate the internal stress and some residue gas of the PCB board. It is a gentle transition of next temperature paragraph also, setting the time 1~5Min in this segment. You also can set the time by the size of the board and the number of the components.

## **2. The purpose and role of the heating**

Activated the liquid flux of tin pulp; under the role of the liquid flux remove the oxide of surface components inside the tin pulp; preparation for soldering. In this section the temperature of the lead alloy solder and precious metal alloy solder should be set (150°C~180°C). eg: Sn42%-Bi58% Indium tin alloy low temperature Lead Solder, Sn43%-Pb43%-Bi14% low-temperature lead solder and so on. Set the Mid-temperature lead solder alloy temperature between (180~220°C); Set the high temperature lead-free solder alloy temperature between (220~250°C). If you have solder and tin pulp information, the temperature of the heating can be installed in less than tin pulp melting point temperature of 10 ° C is the best around.

## **3. The purpose and role of the soldering**

The purpose is to complete the SMT soldering. As this stage is the highest temperature in the whole soldering process, the components is easy to damage. This process the solder physical and chemical changes of the largest are also to the improvement of soldering process. The solder dissolves very easily in the high temperature oxidation in air. If you have solder and tin pulp information, you can installed the temperature of the soldering higher than tin pulp melting point temperature of (30~50° C). We divided the solder into three: low temperature solder ( 150~180 ° C ) ,mid-temperature solder ( 190-220°C ) , high-temperature solder(230~260°C). Now commonly used lead-free solder materials for high-temperature solder, low-temperature solder is generally precious metals lead-free solder and the special requirements of low-temperature lead solder, General electronic products use rarely, it often use in specific requirements for electronic equipment. At present, many lead-free solder are also no substitute for lead solder as the mid-temperature lead solder has excellent electrical properties, mechanical properties, impact resistance properties of hot and cold, the antioxidant properties, therefore, in a common electronic products also large-scale use.

In this segment you can set the time according to the requirement in the following. After high temperature melting solder shown as liquid all the components of SMT floating on the surface of the liquid solder. In the surface tension effects of the flux and liquid, floating components will be move to the center of the solder pad have the role of reform automatically. Also in the humid of the solder flux the solder tin and surface metal of components formed

alloy layer infiltrated into components structural organization, which form the ideal soldering structural. Setting the time about (10~30s), a large area and the larger components shade of PCB should be set much longer time. The small area or less parts PCB set shorter time generally. In order to ensure quality of back solder in this stage should shorten the time as much as possible to protecting components.

## **4. The purpose and role of the heat preservation**

Let high-temperature liquid solder solidified into solid-state soldering points. Solidification quality has a direct impact the crystal structure of the solder and mechanical properties. If the solidification to fast will lead the solder formation of crystalline rough, solder joint is not bright, mechanical properties decrease. Under high temperature and mechanical impact, soldering points easily crack lose mechanical and electrical connections role, lower product durability. We always use to stop heating methods and heat preservation for some time. In the temperature slow decline process the solder can solidification and crystal good. Generally set the temperature point lower than the solder point 10-20 ° C around. Use of natural cooling when the temperature dropped to the temperature point it will enter cooling paragraph.

## **5. The purpose and role of the cooling paragraph**

This cooling segment is simple, usually cooled to the temperature will not scalding the people. To speed up the process of operation, may also stop the process when the temperature fell to below 150°C. To avoid burns to use tools, hand belt or heat resistant glove take out the PCB board.

## **6. Note**

General temperature curve set from the low-temperature, after satisfy the soldering requirements as much as possible to reduce the soldering temperature. Also can through extend back soldering time to reduce the temperature, this will be conducive to the protection of low-temperature components, especially some connectors and plug. Some components can not satisfy temperature requirement, can be used to after soldering to solve.

## Common alloy solder temperature curve adjustment parameters

Solder Type	proportion	Warm-up (°C/1min)	Heating (°C/1min)	Soldering °C/30s	Preservation °C	Cooling °C
Low-temperature ,leaded	Sn43-Pb43-Bi14	100-120	130-150	200-210	170	150
Lead-free low temperature	Sn42-Bi58	100-120	120-130	180-200	150	150
Lead-free low temperature	Sn48-In52	100-120	120-130	180-200	150	150
Lead, mid- temperature	Sn63-Pb37	130-150	170-180	230-240	180	150
Lead, mid- temperature	Sn60-Pb40	130-150	170-180	230-240	180	150
Lead, mid- temperature	Sn62-Pb46-Ag2	130-150	170-180	230-240	180	150
Lead-free, mid- temperature	Sn96.5-Ag3.5	130-150	180-190	240-250	240	150
Lead-free, mid-temperature	Sn87-Ag3-Cu3-In7	130-150	180-190	240-250	240	150
Lead-free, mid-temperature	Sn91-Zn9	130-150	180-190	240-250	230	150
Lead-free mid-temperature	Sn95.4-Ag3. 1-Cu1.5	130-150	180-190	250-260	240	150
Lead-free mid-temperature	Sn99.3-Cu0.7	130-150	180-190	270-280	260	150
Lead-free high temperature	Sn94-Ag3-Cu3	130-150	190-220	240-250	240	150
Lead-free high temperature	Sn97-Cu3	130-150	190-220	270-280	250	150
Lead-free high temperature	Sn95-Sd5	130-150	190-220	270-280	250	150

## Common alloy solder physical constant and characteristics

Solder alloy									Melting temperat ure	Mechanical properties			conductivi ty
Sn	Pb	Ag	Sb	Bi	In	Au	Cu	Zn	Liquidus ( °C )	Push Strength ( MPa )	Elongati on ( % )	rigidity ( HB )	
63	37								183	61	45	16.6	11.0
60	40								183	60	45	16.6	11.0
10	90								299	41	45	12.7	8.2
5	95								312	30	46	12.0	7.8
62	36	2							179	64	39	16.5	11.3
1	97.5	2.5							309	31	50	9.5	7.2
96.5		3.5							221	45	55	13	13.4
	97.5	2.5							304	30	52	9.0	8.8
95			5						245	40	38	13.3	11.9
43	43			14					163	55	57	14	8.0
42				58					138	77	20-30	19.3	5.0
48					52				117	11	83	5	11.7
	15	5			80				157	17	58	5	13.0
20						80			280	28	-	118	75
	96.5					3.5			221	20	73	40	14.0
87		3			7		3		221	45	60	14	9.0
91								9	199				
95.4		3.1					1.5		217				
99.3							0.7		227				
95			5						240				

## Running operation

There are two working mode to select in this equipment, which are **"Solder"** and **"Repair"**. The mode **"Solder"** is designed to solder the circuit board components, the whole process are **"PREH"** (warm-up), **"HEAT"** (heating), **"SLDR"** (solder), **"KEEP"** (heat preservation) and **"COOL"** (wait for the machine to cool down); the mode **"Repair"** is designed to dismantle circuit board components, there is only one temperature setting segment. Before you enter the working mode, make sure the parameters whether right or not.

You must set the parameter of the machine when you first time use it or the tin pulp formula has been changed. You also can change the language Chinese or English which you want.

### 1. power on

Turn on the main power switch back of the instrument, on the left top of the display have red light lighted, then press the key **"ON/OFF"** on the panel, **"简体中文"** and **"English"** displayed in the screen, and the LED of the fan is lighted. As shown in "Fig 3":



Fig 3 Operation Panel

### 2. Select the language

As shown in "Fig3", the display shows **"简体中文"** and **"English"**, You can press the key **"Ç"** or **"È"** to change it, and press the key **"SET"** to save

the setting. The screen arrowhead pointed is the language which you selected, the acquiescence is you select last time.

### 3. Select working mode

After you select the language the display will be show the work state **"Back soldering"** or **"Repair"**, press the key **"È"** to select the work mode. As shown in **"Fig4"**、 **"Fig5"** under the standby screen, press the key **"RUN"** to enter the working state, press the key **"SET"** to enter the parameters setting, press the key **"ON/OFF"** to exit the operation system.

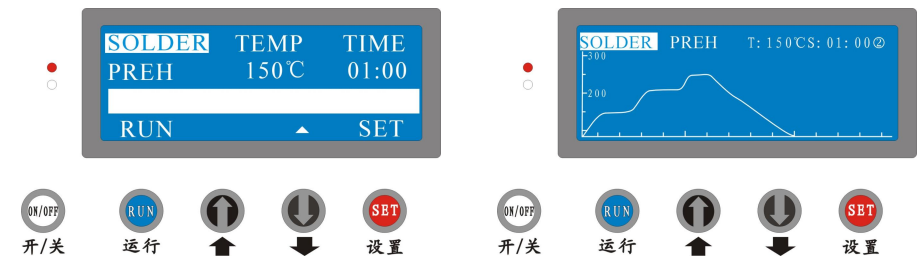


Fig 4 Text Standby interface

Fig 5 Curve Standby interface

### 4. Setting parameters

On the standby menu press the key **"SET"** to enter the parameter setting state. The mode column displayed the current mode **"Back soldering"**. The segment column displayed the current selective segment, press the key **"Ç"** or **"È"** to select segment you want to setting. Press the key **"RUN"** returns back the standby menu, and press the key **"SET"** to enter the temperature setting state. As shown in figure 4.

#### ※ Setting parameter of warm-up

Press the key **"SET"** once to enter the setting state of warm-up, as shown in fig 5. Press the key **"SET"** again enter the temperature setting state, as shown in **"Fig6"**、 **"Fig7"**、 **"Fig8"** 、 **"Fig9"**、 **"Fig10"**、 **"Fig11"**、 ,

press the key “Ç” or “È” change the temperature between (70~150 °C). Press the key “SET” to saving or press the key “RUN” to discard modification.

After temperature setting, press the key “SET” once to enter the time parameter setting state, as shown in . Press the key “Ç” or “È” setting the time between (0~5Min), press the key “SET” to saving. After saving the parameter, press the key “RUN” enter the standby state, as shown in

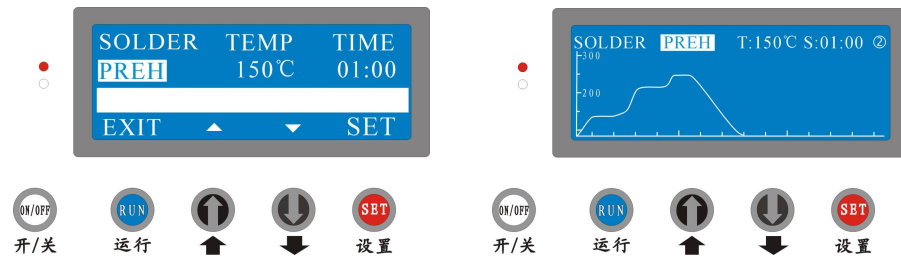


Fig6 Text Pre-heat settings

Fig7 Curve Pre-heat settings

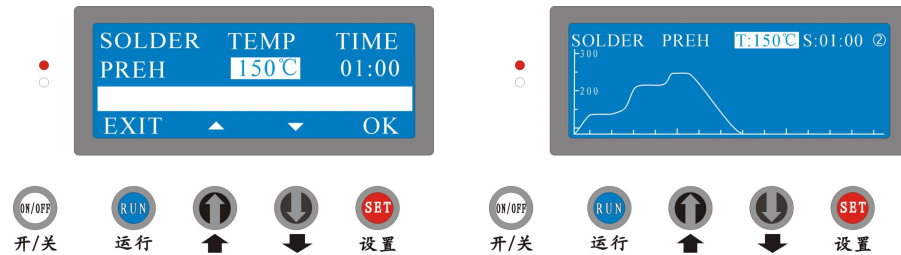


Fig8 Text Temperature settings

Fig9 Curve Temperature settings

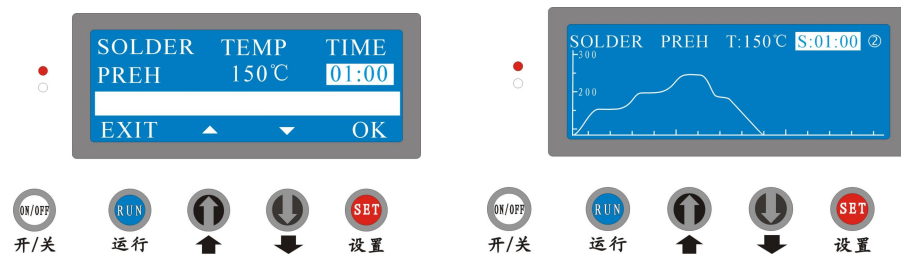


Fig10 Text Time Settings

Fig11 Curve Time Settings

## ※ Setting parameter of heating

As shown in “Fig12”、“ Fig13”、“ Fig14”、“ Fig15”、“ Fig16”、“ Fig17” , press the key “È” select the heating segment, the screen display “heating”, press the key “SET” enter the temperature setting state. As shown in press the key “Ç” or “È” setting the temperature between (warm-up segment~220°C) . Press the key “SET” save the temperature setting and enter the time setting state. As shown in , press the key “Ç” or “È” setting the time between (0~5Min), press the key “SET” to saving and return back mode select or press the key “RUN” enter the operation standby state, as shown in



Fig12 Text Heat settings

Fig13 Curve Heat settings

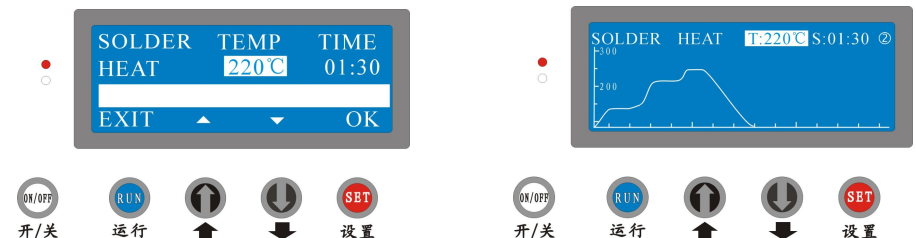


Fig14 Text Temperature settings

Fig15 Curve Temperature settings

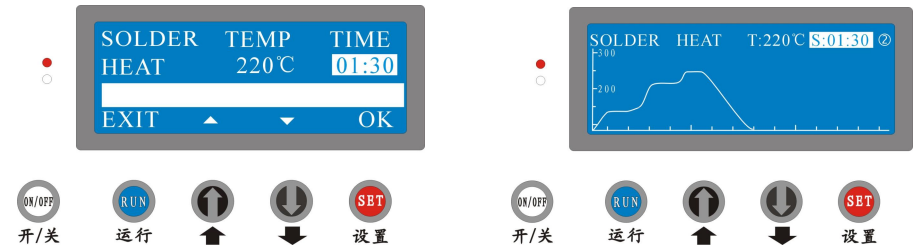




Fig 16 Text Time Settings

Fig 17 Curve Time Settings

### ※ Setting parameter of soldering

Under the interface in “Fig18、”Fig19”、“Fig20”、“Fig21”、“Fig22”、“Fig23” , press the key “**È**” select soldering segment, and then press the key “**SET**” to enter the temperature setting state. Press the key “**Ç**” or “**È**” setting the temperature between (heating segment~300℃). Press the key “**SET**” save the setting and enter the time setting state. When the temperature setting between (250~300℃) setting the time between (0~30s); when the temperature lower than 250℃ setting the time (0~1Min). After that press the key “**SET**” to save the setting or press the key “**RUN**” to discard modification.

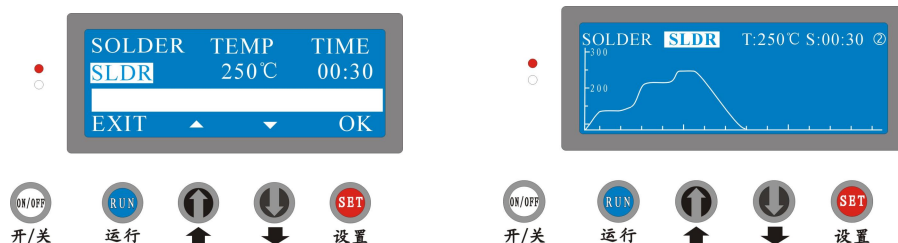


Fig 18 Text Welding set

Fig 19 Curve Welding set



Fig 20 Text Temperature settings

Fig 21 Curve Temperature settings



Fig 22 Text Time Settings

Fig 23 Curve Time Settings

### ※ Setting parameter of heat preservation

Under the interface in “Fig24”、“Fig25”、“Fig26”、“Fig27” , press the key “**È**” select heat preservation segment, and then press the key “**SET**” to enter the temperature setting state. Press the key “**Ç**” or “**È**” change the setting value and then press the key “**SET**” to save it, or press the key “**RUN**” to discard the modification. You can’t change the setting temperature lower 50℃ than the last process.

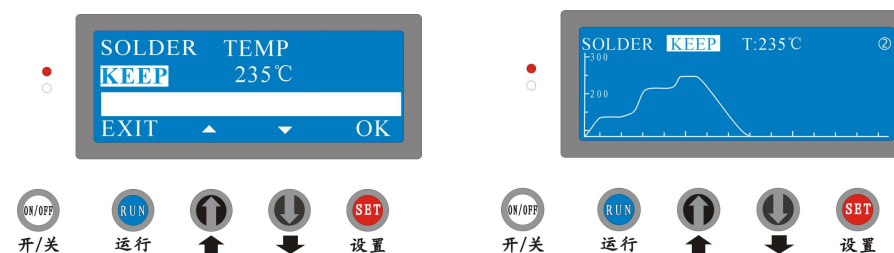


Fig 24 Text Insulation set

Fig 25 Curve Insulation set



Fig 26 Text Temperature settings

Fig 27 Curve Temperature settings

### ※ Setting parameter of cooling



Under the interface in “Fig28”、“Fig29”、“Fig30”、“Fig31”, press the key “**È**” to select cooling segment, and press the key “**SET**” to enter the temperature setting state. Press the key “**Ç**” or “**È**”change the setting value from 70℃ to the setting last process, and then press the key “**SET**” to save it, or press the key “**RUN**” to discard the modification.



Fig 28Text Cooling settings

Fig 29Curve Cooling settings

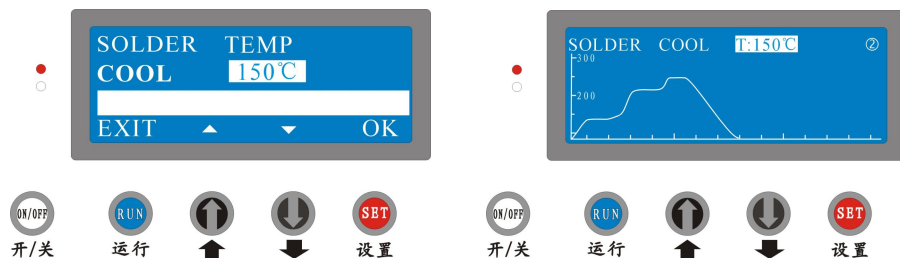


Fig 30 Text Temperature settings

Fig 31 Curve Temperature settings

### ※ Setting parameter of repair mode

Under the interface of standby as shown in “Fig32”、“Fig33”、“Fig34” “Fig35”、“Fig36”、“Fig37”, press the key “**È**” to select the repair mode, press the key “**SET**” to enter the temperature setting state as shown in. Press the key “**Ç**” or “**È**” to change the temperature, press the key “**SET**” to save. On the repair mode the temperature range is divided into three parts, when the temperature setting between (70~150℃) no need to setting time; when the temperature setting between (150~200℃), setting the time between (0~15Min); when the temperature setting between (200~250℃), setting the time (0~10Min).

When the machine operation set time will shut down automatically.

**NOTE:** On the setting the mode, if the machine have nothing operate it will return back to the standby state; on the standby state, the machine have nothing operate over 30Min will shut down automatically.



Fig 32Text Maintenance

Fig 33Curve Maintenance



Fig 34Text Temperature settings

Fig 35Curve Temperature settings



Fig 36Text Time Settings

Fig 37Curve Time Settings

### Back soldering operation

After setting the equipment have safety conduction to operation. Put the circuit board in the middle of the tray, closed chassis, press the key “**RUN**”

enter the working state, as shown in “Fig38” 、 “Fig39” . The working lamp of machine will be light, and the screen will be display: working...” the temperature display current temperature, the time display setting time. When the temperature reaches the set point, the time start to countdown, after the completion of the countdown the machine will enter the next section. When the machine is working the working lamp will be shut down or flashing, when the actual temperature over the setting value 5℃,the machine will open the fan to cooling. When the machine is running you want to exit please press the key “RUN”. You also can press the key “RUN” to stop exhaust and return to standby mode.

When the machine running to cooling segment, fan starts and full exhaust. When the temperature cooling to setting value the buzzer will be alarm, status bar shows that the “complete”.



Fig 38Text Operation

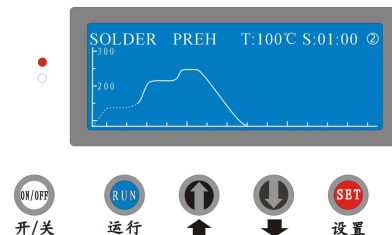
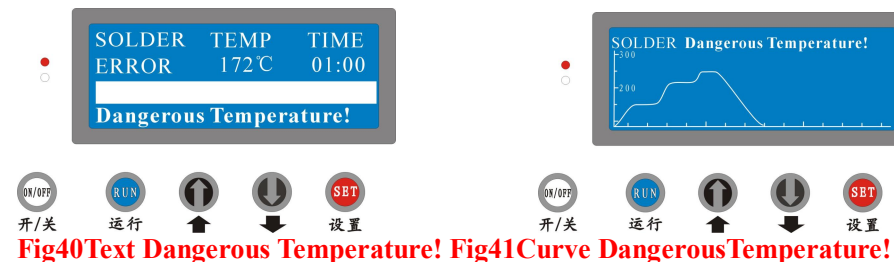


Fig 39Curve Operation

## Faults alarm

### 1. Dangerous temperature

There is a highest safe setting-temperature on each process while the machine working. After you switch on the machine it will detect the current temperature. If the temperature exceeds the safe temperature 10℃, the display will show “Dangerous Temperature!” and blink. The buzzer alarm and then the fan start to work. The alarm will be stop and the machine running normally when the temperature decline to safety. As shown in “Fig40”、 “Fig41” :



### 2. Failure of detecting element

When there is something wrong of the temperature-detecting element, the screen displayed “Detecting Element!” as shown in “Fig42”、 “Fig43” ; the machine alarm and the fan start to work. You can also press the key “SET” or “RUN” to quit and return standby menu.



Fig42 Text Detecting Element!

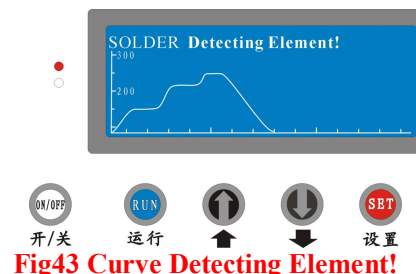
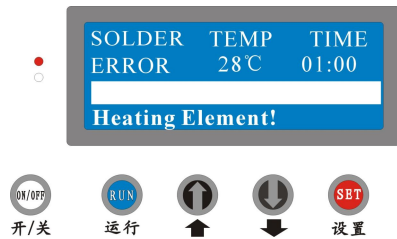


Fig43 Curve Detecting Element!

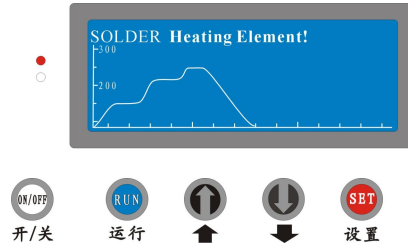
### 3. Failure of heating element

When there is something wrong of the heating element, the machine will alarm, and then the fan start to work, the screen displayed “Heating Element!” as shown in “Fig44”、 “Fig45” . You can press the key “SET” or “RUN” to quit and return standby menu.

When the machine alarm, it will enter the safe mode automatically. If the fan did not work or the heating element working continues, you had better turn off the power immediately and check the fault.



**Fig44 Text Heating Element!**



**Fig45 Curve Heating Element!**

## Attentions

1. Please use the special power supply outlet that is over 15A solely, never used the same outlet with other electrical appliance. Must ensure the grounding well.
2. The Infrared Reflow Oven should be set horizontally; there should be over 20cm between its periphery and walls.
3. Don't use the machine on wet or high temperature environment.
4. Don't use the water to clear the machine body directly.
5. Don't use the iron wire or other tools insert or plug up the air intake and the air outlet.
6. Don't make the dangerous goods that is combustible、 explosive near the machine. Don't dry the goods which have combustible gas.
7. Don't hit the body; avoid damaging the heat pipe. If detects the heat pipe had been break, should turn off the power supply and repaired it.
8. Don't stretch your hand into the cabinet when the machine has not fall to the safe temperature.
9. Don't use the machine on tablecloth, to prevent plug up the air intake.
10. If the heat pipe damaged, must replace it with the same manufacturer production.